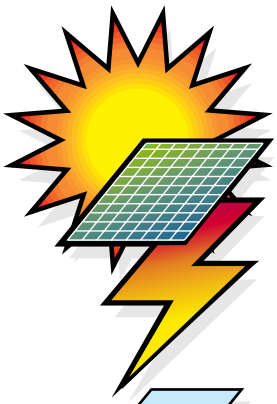

Photovoltaics 10

1. Silicon is the most common material used in solar cells and modules. It's also the second most common element in the Earth's crust. What element is more common?
   a. Carbon b. Oxygen c. Hydrogen d. Aluminum

2. Which of the following elements is rarer than gold (although 1/3 as expensive)?
   a. Cadmium b. Gallium c. Arsenic d. Indium

3. High efficiency and radiation resistance are important for solar cells or modules placed in space. Of the following, which is the most desirable PV material for space applications?
   a. Cadmium telluride b. Amorphous silicon
   c. Copper indium diselenide d. Gallium arsenide

4. Why is doping done to silicon?
   a. To purify the silicon
   b. To create the uniform structure necessary for electrons to move within silicon
   c. To create the p-type and n-type layers necessary to create an electric field in a solar cell
   d. To help electrical contacts bond to the silicon

5. How many electrons does a normal atom of silicon have?
   a. 4 b. 6 c. 8 d. 14

6. What two elements are most commonly used to dope silicon?
   a. Boron and phosphorous b. Carbon and phosphorous
   c. Boron and aluminum d. Carbon and aluminum

7. What is the approximate photon energy of red light?
   a. 0.5 eV b. 1.0 eV c. 1.7 eV d. 2.7 eV

8. What is the primary advantage of a multijunction solar cell?
   a. It can produce more power by more efficiently converting different light wavelengths to electricity
   b. It includes a "tunnel diode"
   c. It is made of gallium arsenide
   d. It can be used in concentrators

9. What do electrical contacts do?
   a. They connect the semiconductor to the external load
   b. They provide paths for electrons to move through the semiconductor material
   c. They enhance the solar cell's ability to absorb sunlight
   d. All of the above

10. What is the advantage of using a transparent conductor on a solar cell or module?
    a. It is nearly invisible to light
    b. It covers the entire surface of the semiconductor
    c. It conducts electricity
    d. All of the above

11. In what year was the photovoltaic effect first documented?
    a. 1776 b. 1839 c. 1927 d. 1955

12. In 1958, the U.S. Vanguard satellite took a PV panel into space. What did the panel supply power for?
    a. The satellite's solid rocket boosters
    b. The satellite's refrigerator
    c. The satellite's radio transmitter
    d. Nothing--it was just a test

13. What is the typical power output of a solar cell?
    a. 1-2 watts b. 50 watts c. 1 kilowatt d. 100 kilowatts

14. What is the primary advantage of a concentrating solar panel?
    a. Less active semiconductor material is needed to produce an adequate amount of energy
    b. It can track the sun
    c. Concentrators tend to heat the solar cells, which increases power
    d. Concentrators increase the intensity of the light, which increases power

15. What does an inverter do?
    a. It reverses the current flowing through a PV panel
    b. It regulates the level of power produced by a PV panel
    c. It converts direct-current (dc) to alternating current (ac)
    d. It maximizes the power produced by a PV panel

16. What does the "balance of system" consist of?
    a. PV panels, mounting structures, and conditioning equipment
    b. Mounting structures, conditioning equipment, and battery storage
    c. PV panels, mounting structures, conditioning equipment, and battery storage
    d. Power conditioning equipment

17. Which region of the light spectrum is responsible for causing your skin to tan?
    a. The lower-energy infrared portion
    b. The higher-energy ultraviolet portion
    c. The visible portion
    d. All portions

18. About how much solar energy reaches the Earth's surface every minute?
    a. The amount a city the size of San Francisco consumes in a year
    b. The amount the entire United States consumes in a year
    c. The amount the entire world consumes in a year
    d. The amount the entire world consumes in ten years.

19. About what portion of all the satellites currently in space use PV panels as their sole source of power?
    a. 1/4 b. 1/2 c. 3/4 d. All of them

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20. Once a PV system is purchased and installed, how much money does it cost to produce energy from it?
    a. Nothing
    b. A few cents a day
    c. A few dollars a day
    d. $10-20 a day

21. While producing electricity, how much pollution does a PV system produce?
    a. None
    b. About as much as a typical automobile
    c. About as much as a typical factory
    d. About as much as a coal-burning power plant

22. Which of the following is a good reason PV power is ideal for pumping water?
    a. PV panels produce direct current
    b. PV panels can be placed right where the electricity is needed
    c. PV panels can be easily moved to new locations as needed
    d. All of the above

23. Which of the following is an example of a PV system with battery storage?
    a. A solar calculator
    b. A solar path light
    c. A solar water pump for cattle
    d. None of the above

24. Why are PV systems great for supplementing utility power?
    a. They can be installed more quickly than a conventional power plant
    b. They can be placed close to where the power is needed
    c. They can be expanded in increments as the demand increases
    d. All of the above

25. Most household appliances operate on what type of power?
    a. Direct-current electricity
    b. Alternating-current electricity
    c. Natural gas
    d. Propane